

Yashwantrao Chavan College of Science, Karad

Department of Computer Science

Question Bank, 2023-2024

Subject: Mathematics (Discrete Mathematics)

Class: B.Sc. CS. (Entire) - I

- 1) Solve the recurrence relation $a_r = 2a_{r-1} - a_{r-2}$ with initial conditions

$$a_0 = a_1 = 2$$

- 2) If $f : A \rightarrow B$ and $g : B \rightarrow C$ are two functions then

a) If each of f and g is one - one then prove that gof is one – one.

b) If each of f and g is onto then prove that gof is onto.

- 3) Find the number of positive integers not exceeding 100 that are either odd or the square of an integer.

- 4) How many integers between 1 and 100 that are not divisible by 5 or by 7.

- 5) Define: (a) Range set (b) one-one function

- 6) Solve the following homogeneous difference equation.

$$4a_r - 20a_{r-1} + 17a_{r-2} - 4a_{r-3} = 0$$

- 7) Construct truth table $P : (q \rightarrow \sim p) \vee (\sim p \rightarrow \sim q)$

- 8) Define : (i) Tautology (ii) Contingency

- 9) Solve the following recurrence relation

$$a_{n+2} + 2a_{n+1} + a_n + 9 \cdot 2^n = 0$$

- 10) Let p : you can take the flight

q : you buy a ticket

Express the statements $p \rightarrow q$ & $p \leftrightarrow q$

- 11) Prove that : $p \rightarrow q \equiv \sim p \vee q$

- 12) Show that at a party of 20 people , there are two people who have the same number of friends.

13) Define : (I) Bijective function

(II) Inverse function

14) Explain types of propositions

15) Find the particular solution of the difference equation

$$a_r + 5a_{r-1} + 6a_{r-2} = 3r^2$$

16) How many integers between 1 and 200 are divisible by 7 or 11.

17) A student can choose a computer project from one of four lists . The four lists contain 21,19,17 & 15 possible projects respectively. How many possible projects are there to choose from?

18) Explain rules of inferences.

19) Construct truth table

$$P: ((q \rightarrow \sim p) \vee (\sim p \rightarrow \sim q))$$

20) Explain following logical connectives:

(I) Exclusive or

(II) Conjunction

21) State & prove De Morgan laws ?

22) Define: (i) Contradiction

(ii) Logical Equivalence

23) State & prove Distributive Laws.

24) Prove that : $p \vee q \equiv \sim p \rightarrow q$

25) Solve the recurrence relation $a_n - a_{n-2} = 0$

26) Find the particular solution of the difference equation

$$a_r + 5a_{r-1} + 6a_{r-2} = 3r^2 - 2r + 1$$

27) Find the homogeneous solution of the difference equation

$$a_n - 6a_{n-1} + 9a_{n-2} = 0$$

28) Find the number of integers between 1 & 1000 which are not divisible by any of 2, 3 & 7.

29) Construct truth table $Q : (p \vee q) \rightarrow (p \leftrightarrow q)$

30) Define: (a) set (b) onto function

31) Prove that : $\sim(p \leftrightarrow q) \equiv p \leftrightarrow \sim q$

32) Show that : $(p \wedge q) \rightarrow (p \vee q)$ is a tautology.

33) Find the particular solution of the difference equation

$$a_r - 4a_{r-1} + 4a_{r-2} = (r+1) 2^r$$

34) Determine the number of integers between 1 & 250 that are divisible by any of the integers 2, 3, 5, 7.

35) State the principle of inclusion exclusion theorem.

36) Niraj wants to leave station B. There are three routes from station B to A & four routes from B to C. In how many ways can he leave the station B?

37) How many numbers are there between 100 & 1000 in which all the digits are distinct?

38) Explain : (i) Addition principle

(ii) multiplication principle

39) Prove that : $\sim(p \vee q) \equiv \sim p \wedge \sim q$

40) Prove that : $p \vee (p \wedge q) \equiv p$